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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/030,342

Applicant(s)

O'BRIEN ET AL.

Examiner

Aaron Strange

Art Unit

2153

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 8-18 have been considered but are moot in view of the new ground(s) of rejection. However, since Barthelemy has been cited again, the arguments directed to that reference are addressed below.
2. With regard to claim 8, and Applicant's assertion that the Erratum to the Barthelemy reference "clearly invalidates the corresponding conclusions" of Barthelemy (Remarks, 9), the Examiner respectfully disagrees. The Erratum simply shows that the actual calculations were in line with the author's expectations (p. 3181). The authors even noted that the value of τ will likely depend on the dimensionality of the initial regular network (p. 3183, col. 1, ll. 22-24). The Erratum merely confirms this observation, since the value of τ was 1 when the size of the system is large enough.
3. With further regard to claim 8, and Applicant's assertion that Barthelemy fails to disclose formation and interconnection of distinct node clusters (Remarks, 10), the Examiner respectfully disagrees. A node, connected to a number of neighbors, forms a cluster. Barthelemy clearly discloses formation and interconnection of a plurality of those structures (p. 3181, col. 2) and states that the "neighborhood[s]" of regular lattices are "preserved". Regarding Applicant's assertion that the clusters in the present invention are "interconnected using a necessarily smaller number of links", it is noted that no such limitation appears in the claims. Applicant has not defined "node clusters"

Art Unit: 2153

in the specification or the claims, and a node connected to a number of neighbors falls well within the broadest reasonable interpretation of a "node cluster".

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 8-13 rejected under 35 U.S.C. 103(a) as being unpatentable over Barthelemy ("Small World Networks: Evidence for a Crossover Picture") in view of Collins ("It's a small world").

6. With regard to claims 8 and 13, Barthelemy discloses a method for constructing a small world network, the method comprising:

interconnecting a plurality of computing nodes to form a plurality of node clusters (start from a regular network with n vertices [nodes] each connected to z neighbors, forming neighborhoods [node clusters])(p. 3181, col. 2)

providing a plurality of cross-links between the node clusters (each node is connected to z neighbors, forming cross links between node clusters)(p. 3181, col. 2);

directly connecting, using the plurality of cross-links, a corresponding plurality of pairs of node clusters selected from the plurality of node clusters in accordance with a

Art Unit: 2153

selection process (apply the "rewiring" algorithm)(p. 3181, col. 2) resulting in a formation of a network of said plurality of computing nodes having a higher clustering coefficient of nodes in comparison with a corresponding randomly-connected network in combination with a lower characteristic path length between the nodes in comparison with a corresponding regularly-connected network (only a few links must be rewired to form a small world network, which maintains neighborhoods [clustering coefficient] like a regular network while reducing the average path length to the same order as a random network)(p. 3180, col. 2, ll. 6-10; p. 3183, col. 1, ll. 21-34); and

wherein the steps of providing the plurality of cross-links and directly connecting the plurality of pairs of node clusters in accordance with said selection process are repeated until the resulting network comprises a small-world network having an average path length between the plurality of nodes falling within a predetermined desired range, independently of a number of said plurality of computing nodes (once the links are rewired, the average path length is calculated; additional links may be rewired [by increasing p] to reduce the average path length as desired)(p. 3182; fig. 2 (a)-(b)).

Barthelemy fails to specifically disclose that the method may be used to construct a scalable computer system. However, Barthelemy expressly suggests that the small-world topology may be a promising topology for studies of known problems, including flow in "information networks".

Collins also discloses various properties of small world networks and suggests several applications of small world networks. Collins explicitly suggests providing a few random cross links between nodes along the backbone of the internet, which could

Art Unit: 2153

reduce the time needed to transfer information via the Internet. In light of these suggestions by Barthelemy and Collins, one of ordinary skill in the art would have had good reason to apply the teachings of Barthelemy to computer networks and solve the problems noted by Barthelemy by implementing a computer system using a small-world architecture. Such a system would maintain a low average path length and high clustering, even for large numbers of nodes, reducing the time needed to exchange information among nodes on the network.

Therefore, it would have been obvious to one of ordinary skill in the art to apply the teachings of Barthelemy to computer networks to construct a scalable computer system as claimed.

7. With regard to claim 9, Barthelemy further discloses that the selection process is a random or pseudo-random process (p. 3181, col. 2).

8. With regard to claim 10, Barthelemy further discloses that the step of interconnecting the plurality of computing nodes is performed such that the node clusters are fully interconnected (rewiring algorithm is applied to a regular network with n vertices each connected to z neighbors) (p. 3181, col. 2).

9. With regard to claims 11 and 12, while the system disclosed by Barthelemy and Collins shows substantial features of the claimed invention (discussed above), it fails to

specifically discloses that the predetermined range of the average path length between the plurality of nodes is less than 2.0, or, more specifically, between 1.5 and 1.7.

However, Barthelemy discloses that adding a few cross-links results in a large decrease in the average path length between nodes (p. 3180, col. 2, ll. 11-15; fig. 1), while maintaining the clustering of the system. One of ordinary skill in the art would have recognized that additional rewired cross-links could have been used, as needed, to reduce the average path length to a desired amount.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the number of cross-links to obtain an average path length less than 2.0, between 1.5 and 1.7, or any other range as desired.

10. Claims 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barthelemy ("Small World Networks: Evidence for a Crossover Picture") in view of Collins ("It's a small world") further in view of Brewer (US 5,859,975).

11. With regard to claims 14 and 18, while the system disclosed by Barthelemy and Collins shows substantial features of the claimed invention (discussed regarding claim 8), it fails to disclose that each node has a plurality of interconnected processors.

Brewer discloses that the use of multiple processors in a single node of a distributed system is well-known in the art (Col 1, Lines 26-31). The use of multiple processors in a single node allows that node to process more information than it would be capable with only a single processor.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a plurality of interconnected processors in each node since it would have allowed the nodes to process more information that they would be capable of processing with only a single processor.

12. With regard to claim 9, Barthelemy further discloses that the selection process is a random or pseudo-random process (p. 3181, col. 2).

13. With regard to claim 10, Barthelemy further discloses that the step of interconnecting the plurality of computing nodes is performed such that the node clusters are fully interconnected (rewiring algorithm is applied to a regular network with n vertices each connected to z neighbors) (p. 3181, col. 2).

14. With regard to claims 11 and 12, while the system disclosed by Barthelemy, Collins and Brewer shows substantial features of the claimed invention (discussed above), it fails to specifically discloses that the predetermined range of the average path length between the plurality of nodes is less than 2.0, or, more specifically, between 1.5 and 1.7.

However, Barthelemy discloses that adding a few cross-links results in a large decrease in the average path length between nodes (p. 3180, col. 2, ll. 11-15; fig. 1), while maintaining the clustering of the system. One of ordinary skill in the art would

Art Unit: 2153

have recognized that additional rewired cross-links could have been used, as needed, to reduce the average path length to a desired amount.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the number of cross-links to obtain an average path length less than 2.0, between 1.5 and 1.7, or any other range as desired.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.


16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron Strange whose telephone number is 571-272-3959. The examiner can normally be reached on M-F 8:30-5:00.

Art Unit: 2153

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glen Burgess can be reached on 571-272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AS
10/8/07



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